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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,098	04/02/2004	Xiao Feng Li	INTEL/17590X-CIP	2151

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HANLEY, FLIGHT & ZIMMERMAN, LLC
150 S. WACKER DRIVE
SUITE 2100
CHICAGO, IL 60606

EXAMINER	
WANG, JUE S	

ART UNIT	PAPER NUMBER
2193	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/817,098	LI ET AL.	
	Examiner	Art Unit	
	Jue S. Wang	2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 April 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01 June 2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-36 have been examined.

Drawings

2. The drawings are objected to because Fig. 2, item 202, the word "Dependences" should be "Dependencies". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 8, 20, and 32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A. The following lacks antecedent basis in the claims:

i. Claims 8, 20, and 32, "the source file" in line 1. Because of the recitation of "a source file" in claims 7, 19, and 31, it is believed that claim 8 was intended to depend on claim 7, claim 20 was intended to depend on claim 19, claim 32 was intended to depend on claim 31, and they are treated as such for compact prosecution of the claims.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fu et al., "Software-Only Value Speculation Scheduling", (hereinafter Fu), in view of Calder et al. "Value Profiling and Optimization", (hereinafter Calder).

7. As per claim 1, Fu teaches the invention as claimed including a method comprising:

identifying an instruction (see Fig 5, steps 1-4, and section 2);

determining a predicted value of the instruction based on a pattern (see section 2 and page 10, last paragraph);

using the predicted value of the instruction based on the pattern to generate a value prediction instruction to predict a run-time value (see Fig 3c, line I7 and Fig 5, step 5); and

combining the value prediction instruction with the one or more machine readable instructions (see Fig 3c and Fig 5, step 5).

Fu does not teach that the steps of identifying and determining a predicted value is performed for a variable and that a predicted value of the variable is used to generate a value prediction instruction.

Calder teaches profiling the value of variables and that value profiling is a valuable tool in guiding the type of speculation scheduling performed by Fu (see section 2.2 and section 6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Fu such that the steps of identifying and determining is perform for variables instead of instructions so that a predicted value of the variable is used to generate a value prediction instruction as taught by Calder because many instructions that are hard to predict or have variant behavior actually access data (variables) that are invariant or are very predictable (see page 16, last paragraph of Calder).

8. As per claim 2, Fu further teaches determining if the run-time value matches the predicted value (see Fig 3c, line I8 and Fig 5, step 7); and generating a value correction instruction to correct the run-time value if the run-time value does not match the predicted value (see Fig 3c, Fig 5, step 8, and page 9, first sentence).

9. As per claim 3, Fu further teaches combining the value correction instruction with the one or more machine readable instruction to be executed subsequent to an invocation of a speculative parallel thread (see Fig 3c, Fig 4, and page 5, last paragraph - page 7; EN: The execution of instructions I4, I5, and I6 are speculated via instructions I4', I5', and I6' which can execute in parallel with instructions I1, I2, and I3. The execution of the patch up code must be executed after the invocation of the speculated execution of instructions I4', I5', and I6' because the patch up code depends on instruction I3 for the value in register R4 whereas I4' is speculatively executed by breaking the dependency of I4 on I3 by predicting the value in R4.)

10. As per claim 4, Fu further teaches combining the value prediction instruction with one or more machine readable instructions to be executed prior to an invocation of a speculative parallel thread (see Fig 3c, Fig 4, and page 5, last paragraph - page 7; EN: the value prediction instruction I8 is executed prior to the speculated execution of instructions I4', I5', and I6' since the execution of I4' depends on the value in register R8 defined in I8).

11. As per claim 5, Fu modified by Calder further teaches the variable is associated with a data dependency (see Fig 5, steps 1-4 and page 5, last paragraph - page 7).

12. As per claim 6, Fu further teaches the one or more machine readable instructions comprises an internal representation (see Fig 3c).

13. As per claim 7, Fu further teaches that the one or more machine readable instructions comprises a source code file (see Fig 3).

14. As per claim 8, Fu does not teach that the source code file comprises a high-level instruction.

Calder teaches performing code specialization based on value profiling for machine instructions in a source code file where the source file comprises a high-level instruction (see Figure 12, page 23, last paragraph, and page 24, paragraphs 1, 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Fu such that the source file comprises a high-level instruction as taught by Calder because programmers might want to inspect the code with value prediction instructions for purposes such as debugging and performance evaluation, and it is easier for programmers to understand high level code rather than low level code.

15. As per claim 9, Fu further teaches that the pattern comprises a predetermined pattern (see Fig 3c, page 7, last paragraph, page 10, last paragraph, and page 11, first paragraph).

16. As per claim 10, Fu further teaches that the determined pattern comprises at least one of a constant pattern, a last-value pattern, and a constant-stride pattern (see Fig 3c, page 7, last paragraph, page 10, last paragraph, and page 11, first paragraph).

17. As per claim 11, Fu does not teach that the constant pattern is based on a most frequent occurring value.

Calder teaches value profiling for variables to identify the most frequent occurring value for the variable (see page 5, paragraphs 4-6, page 6, paragraph 1-2, section 4.2, and section 6).

18. As per claim 12, Fu further teaches that the predicted value is created by a profiling technique (see Fig 5, steps 1, 4, page 10, last paragraph, and page 11, first paragraph).

19. As per claims 13-24, they are the apparatus claims of claims 1-12. Therefore, they are rejected using the same reasons as claims 1-12.

20. As per claims 25-36, they are the machine readable medium claims of claim 1-12. Therefore, they are rejected using the same reasons as claims 1-12.

Conclusion

21. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Ju (US 6,260,190 B1) is cited to each a unified compiler framework for control and data speculation with recovery code.
- Dundas (US 6,883,086 B2) is cited to teach repair of mis-predicted load values.
- Chaudhry et al. (US 7,051,192 B2) is cited to teach facilitating value prediction to support speculative program execution.

- Wilkerson et al. (US 2003/0131345 A1) is cited to teach employing value prediction with the compiler.
- Nair et al. (US 2004/0230960 A1) is cited to teach using value prediction to break constraining dependencies in iterative control flow structures.
- Shiwen Hu, Ravi Bhargava, and Lizy Kurian John, "The Role of Return Value Prediction in Exploiting Speculative Method-Level Parallelism", 2002, TR-020822-02, University of Texas at Austin, retrieved from: http://citeseer.ist.psu.edu/hu02role.html. This document is cited to teach the performance impact of return value prediction on chip multiprocessors that support speculative method-level parallelism.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jue S. Wang whose telephone number is (571) 270-1655. The examiner can normally be reached on M-Th 7:30 am - 5:00pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on 571-272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

J.W.
6/6/2007

MENG-AL T. AN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100